Good reasons to implement transnational European diploma programs in Computer Science

Gabriel Michel, Sorin Stratulat

Proceedings of the 1st International Conference on EUropean Transnational Education (ICEUTE 2010)

Good Reasons to Implement Transnational European Diploma Programs in Computer Science

Gabriel MICHEL and Sorin STRATULAT

Department of Computer Science, Paul Verlaine University of Metz, France

email: Gabriel.Michel@univ-metz.fr, Sorin.Stratulat@univ-metz.fr

Abstract

During the current period of economic crisis, it is the time more than ever for Europe to build up by itself. In this context, human mobility between different EU countries becomes a strategic goal. In this paper, we will discuss about student mobility from different points of view (geographical, social and cultural) and propose solutions to improve student mobility in the field of computer science. Some preliminary results about concrete case studies concerning French-German double degree programs at the ISFATES-DFHI institute are presented.

Keywords: Student mobility, Double degree, Master, Computer Science, Europe, Intercultural, Learning, Professional skills, Surveys, Erasmus.

1. Introduction

Student mobility and acquiring mobility skills are often considered as important factors for any student development. In fact, knowledge of different foreign languages and cultures, as well as practice in international environments are very useful for the professional life. Moreover, it has been proved that international mobility implies higher salaries after several years of working experience [1]. Today, it is crucial for Europe to build up from its own resources. In this context, human mobility between different EU countries becomes a strategic goal; in particular, students, researchers and teachers mobility has well-known impacts on innovation. In this paper, we will firstly present some case studies and statistics about the role of mobility at worldwide level, then at European level. Secondly, we will detail some studies about the mobility of computer science students that follow double degree and/or joint degree Master programs. We will shed the light on the problems and perspectives by presenting some preliminary results about case studies concerning a 20-year French-German computer science program. Finally, we will discuss about the future of similar European programs at Bachelor and Master levels.

2. Student Mobility

We will present some general facts about the student mobility at worldwide and European level, then we will detail for the computer science domain.

At worldwide level. During 2006, there were 2.9 million international students (UNESCO). We can notice that the impact of the international mobility on the professional life depends on the geographical zones the students come from. For example, the most part of the students originating from rich countries study abroad to learn new foreign languages and discover new cultural environments. This is not the case for students coming from developing countries that are mostly interested to obtain academic degrees and experience other than those offered by the home country. We talk about social and spatial distances between the home and host countries.

In the current technological society, given the reducing number of scientific programs, the role of international students becomes crucial for the knowledge economy of any country. More than a third of the scientific and technical personnel in the USA having a Master of PhD degree comes from abroad, mainly from India and China. About 75% of the Chinese international students are researchers and engineers: more than half of them live in the USA, 6.7% in Germany, 5.3% in Great Britain and 3.7% in France. Less than a third go back to China once the studies abroad are finished [3]. For the moment, Europe is less attractive for Asian students and the most part of the foreign researchers in scientific fields are European.

At European level. Several studies have been carried out on the employment of former students [1]. All of them conclude with analogous results. As we will see later, the student mobility in Europe is rather limited, has smaller impact on the careers and is often reserved to higher social classes. The results of the CHEERS and REFLEX surveys (2005) have shown that only 3% of the high-qualified employees in Europe come from European countries, and this situation will not improve in the near future. The REFLEX survey shows that among the ancient students that worked in foreign countries for 5 years after getting their diploma, 17% live in Germany, 12% in Great Britain, 11% in Switzerland and 9% in the USA. For example, Germany is the favorite destination for the Austrians (43% of graduate students are working abroad) and Dutch people (32%). The French, Czech and Swedish graduates prefer Switzerland, Great Britain and the USA, respectively. The following table shows the main destinations for working abroad (in %) for people from different European countries.

Moreover, this survey measures the impact of the international mobility during the student period on the professional life. It shows that:

- the students studying abroad are often originating from families where the parents already followed graduate studies (results also confirmed by another survey in Brittany about 500 students : 43% of the students have parents occupying managerial positions and only 3% have worker parents) [9],
- students with international experience prior to the studying period (issued from migrants families, for example) are more open to mobility,
- the salaries for students having studied abroad are (a little bit) higher than for non-mobile students,
- students having studied abroad are easier accepted in big-size enterprises.

Table 1. Main destinations for foreign workers (in %)

Home Country → Host Country ↓	Germany	France	Spain	Finland	Czech Republic
Germany	-	16	12	12	20
Switzerland	16	31	0	8	3
UK	10	5	7	12	34
USA	18	0	16	4	4
France	6	-	13	0	2
Spain	2	4	-	6	1
Italy	0	0	8	0	1
Romania	0	3	0	0	0
Portugal	0	0	8	0	0

In Europe, students can choose between spontaneous mobility (i.e. the student initiates the enrollment process) and the organized mobility (by ERASMUS programs, essentially). The most part of these students choose ERASMUS programs to study in another European country. However, compared with the European student mass, the number of ERASMUS students is small: only 1% of European students were involved into ERASMUS exchanges.

The project Valera "Value of ERASMUS Mobility" of the EU [5] aims to establish the impact of mobility within the sub-ERASMUS program of SOCRATES on the student and teacher careers. With respect to student mobility, professional "success" was measured primarily in terms of general and international competences, transition to work, first and subsequent employments, and international aspects of employment. According to the most recent survey, the impact of ERASMUS is very good for the students if we compare this with those students without international experience (higher status, higher wages as well as a better chance for reaching a position appropriate to their level of education, better career opportunities and skills).

International experience notably seems to reinforce adaptability, initiative, the ability to plan and assertiveness, higher socio-communicative skills as well as better ways of problem-solving and leadership. More than half of the former mobile students assess their

knowledge and understanding of international differences of different cultures and societies, and almost half of them state that their knowledge of other countries is as important as their job tasks. But the impact of ERASMUS is smaller than before according to surveys of previous generations for graduates in obtaining a first job, getting a higher income and taking over job tasks for which visible international competences are needed. This is most likely caused by a growing internationalization in general that leads to a gradual decline of the uniqueness of the ERASMUS experience. But the number of mobile students is still small compared to the general student population and depends both on the country, on the scientific fields and also… on the parents income. In Europe, students who are mobile are still mostly students who major in business and management, who graduate from reputable business and engineer schools and who take advantage of this mobility that has been imposed on them.

In computer science. In the field of computer science, the mobility is very low in Europe compared to the other domains. To our knowledge, there is still no survey explaining the lack of mobility in this strategic domain (notice that at the PhD level, the mobility is more important). The main reasons seem to be the following:
- in France (and we think that it is not very different in other european countries), the computer science students originate mostly from low and intermediate social classes [8]. As we have previously seen, it is more difficult for them to study abroad for economic and psychological reasons,
- there is a loss of attraction for sciences and technology in the occidental world: therefore, the number of candidates for the computer science programs and their knowledge level are going down (today, the best students are aiming at business, finance and laws programs),
- the knowledge level of foreign languages concerning the scientists is often low: in most of European countries, this fact comes from the bad management of and little interest in foreign language teaching. Computer scientists are usually acknowledged with English, but very few are studying other foreign languages. For this reason, the most part of the international computer science students plan to study within programs provided in English (for example, Great Britain, Ireland, Scandinavian countries and some new EU countries),
- in France, with a good degree in CS, it is rather easy to find a job in computer science (excepting the crisis periods: we will see it in a further study) [7], so the mobility is not so crucial.

The mobility of computer science students is mainly performed via ERASMUS exchanges. To have even more mobile students, joint and double degree programs have been devised. Such kind of programs are rare in computer science w.r.t. other domains and other non-European regions (for example, the USA). The European institutions involved in joint and/or double degree programs are usually prestigious and integrate a tough selection process of students. Here are some examples of existing joint/double degree programs: on

oriented software engineering technologies[4], on computational logic[5] and, more recently, a program that will start next September on Net-Centric/Media Informatics, Life Science Informatics, and Embedded Systems Informatics[6]. Between the different European countries there are very few joint/double Master degree programs. For example, between France and Germany there are only two, opened to ... a dozen of students. Would it be necessary to develop this kind of programs ? In the following, we will try to answer to this question by analyzing a survey concerning one of these programs.

3. Assessment of the last 20 years of transnational diplomas

History of the French-German institute. Isfates-DFHI [4] was created on September 15th, 1978 during a meeting at the Franco-German summit of Aachen in order to pose the first stepping stones of an European education. The institute was created between the towns of Metz (in France) and Saarbrücken (in Germany). At the beginning, the students obtained a French "licence" and a German engineer diploma in three fields. The computer science department was created in 1990, and other departments such as the civil engineering and logistics departments followed soon after. Since its creation, this institute has not ceased to develop and adapt. Today, nearly 2,200 French and German students follow the bi-national training of ISFATES and obtain the both French and German university diplomas. Since 1997, it belongs to the Franco-German University / Deutsch-französische Hochschule (UFA/DFH) [2]. Currently gathering 150 establishments, 4800 students were registered with the UFA for the academic year of 2009/2010. The ISFATES-DFHI, with its 400 registered students, remains today the most significant Franco-German training program delivering French and German (double) diplomas.

Description of ISFATES-DFHI. Currently ISFATES-DFHI (or ISFATES, for short) has 6 branches: Computer Science, Logistics, Management Sciences, Civil Engineering and Infrastructures, Mechanical Engineering and Industrialized Manufacturing, and Engineering Systems. For each branch, a group between 15 and 30 French and German students " will travel " back and forth each year from one university to the other. The students of a given year also have some "inter-branch" courses in order to maintain a certain cohesion. The structure of the programs is as follows:
- for the Bachelor degree: three semesters take place in Metz and three semesters in Saarbrücken; at the end, the students obtain a joint Franco-German Bachelor degree. It is also possible to spend one semester with Erasmus in another country,
- for the Master degree: three semesters of study followed by a semester of internship in a third country. For the three semesters of study, the first one takes place in Saarbrücken, the second in a third country or Saarbrücken, and the third in Metz. In the end, a joint Franco-German Master degree is obtained.

4 http://www.emn.fr/x-info/emoose/ ,
5 http://www.computational-logic.eu/home.php
6 http://eumi.unitn.it/edu/eumi/home.xml

Alumni survey. We present here rapidly one survey which was carried out with 120 former students (for more details see [6]). [7]The average age was 29 years old with 5 years of professional experience on average. This survey was carried out in July and August 2002 in the perspective of a renewal of ISFATES programs. It was primarily focused in responding to recent concerns such as:
- taking into account the current situation: " what type of courses should be offered in order to make the institute more attractive ? ", …
-" is the Master degree necessary and which Master should be put into place ? " .

We have asked more questions about career, mobility, wages, vision of their future professional life and satisfaction with their training. We will reveal in this part only this last data. The answers show that there was a majority of students that came from more disadvantaged social-professional levels, a huge mobility for the first job (especially for the French students: 40% in Germany, 10% in another country, in contrast to German students: 12% in France and 9% in another country), annual wages still high in taking into account their level of studies (comparable with those of students graduating very good engineering schools). The ideal Master should have a lot of management and soft skills (eventually in connection with a company). Finally, the very significant indicator of satisfaction with this training yields from the answers to the question " If you have to start again, would you repeat the experience ? ": 83% answered yes, 7% no and 10% did not know.
Some other indicators. Since the creation of the computer science department of ISFATES in 1990, one could note very visible differences between the students who followed this curriculum compared to the students of the national education from ance and Germany. There was no significant difference in the average mark of a group of computer science students from ISFATES with the average mark of students from the national group (even if the students from ISFATES had completed, in general, less computer science courses throughout their training compared to other students). The difference was extremely favorable for ISFATES when it was question of finding a training course or an employment w.r.t. the average search period, the type of tasks and earned salaries. And this variation was even more visible during the years of the computer science crisis.
Let us notice that in a period of full employment in computer science, the number of candidates in the computer science department of ISFATES fell down because mobility was not necessary to find a job. And, of course, as soon as the job market in computer science weakened, one could note an increase in the number of candidates again. Therefore the students of ISFATES have always interested employers, as much as the students graduating more prestigious engineer schools and universities.

[7] This survey took place in 2002, but the situation did not change too much since that time, so the conclusions of the survey are still valid today.

4. The Problems to Be Solved

The competition. In general, one of the biggest problems to overcome is the competition between different programs. Here, ERASMUS programs have low influence on the technological programs, not enough opened to support student mobility. For example, if we compare our surveys with the results of the Valera study on ERASMUS, one finds that the benefits of mobility are much more favorable for students from ISFATES. This can be explained by the following reasons: the duration of mobility, a better integration (even when the semester takes place in the country of origin, the student is in a bicultural group), the curricula of the different semesters are synchronized (this is not the case for ERASMUS), and a diploma from both countries. The importance of a double degree no longer needs to be proven. For example, most German companies in computer science technology do not know about the French diplomas, and viceversa. On the other hand, any French (German, resp.) person, having a German (French, resp.) diploma benefits of an easier access to the German (French, resp.) labour market.

In terms of competition, only the other transnational computer science diplomas count. As we have already noticed, the number of these diplomas is small w.r.t the number of potential students. So, it is difficult to talk about competition between different computer science Franco-German programs (even in the frame of UFA). But, if we assume that the number of potential students opened to mobility is small, competition may play an important role.

Problems in learning French and German and in pursuing technological programs. These are, by far, the most difficult problems. The difficulties in learning foreign languages are mainly due to inadequate learning programs (only 15,4% of French students learned German, and 19,7 % of German students learned French[8]). Most of the ISFATES students come from regions close to the French-German borders, where still exist schools teaching in the partner language and are open to the culture of the partner country. On the other hand, as previously mentioned, we assist to a diminishing number of candidates for technological programs.

Lack of visibility. In spite of their reputation acquired over the years, the ISFATES programs are hardly accessible to high-school pupils, as confirmed by regular surveys. Similar institutes are still rare, which leads to distrust. Most of the pupils know about ISFATES by the means of the family (brother or sister that already followed ISFATES programs) and/or friends.

[8] French-German Portal http://www.france-allemagne.fr/Apprentissage-de-la-langue-du,1126.html

5. Solutions

A long lasting diminishing number of potential candidates will spoil the ISFATES reputation internally (concerning both students and teachers) as well as externally (w.r.t. the recruiters and candidates). Here are some solutions we are working on:
- a better communication policy to attract more students (especially in Germany),
- more attractive speciality units, like Human Computer Interaction (including psychology and ergonomics units), and other kind of programs, for example alternating short periods of study and placement in industry, and with units about social sciences and management,
- an opening towards other countries: proposal of ERASMUS semesters abroad and cooperation with Polytechnics Montreal (Canada).

6. Discussions and Conclusions

Student mobility has a strategic role for the industrialized countries, in paticular for students studying scientific domains. However, it remains marginal in Europe, especially for the computer science domain. On the other hand, student mobility puts added-value to any curricula. To go beyond the frame of ERASMUS programs, already known for their positive impacts on the students' future career, the transnational European programs have been implemented.

We can conclude that studying abroad and obtaining a double diploma is, for a computer scientist, a passport for an even more successful future career than if he had not been mobile (a greater mobility, a starting salary significantly higher than those holding an equivalent national diploma). And this is the case even if, in the beginning, this computer scientist is not particularly brilliant or good at learning foreign languages, nor coming from an elevated social class. Our study proves this fact and shows that international curricula are very effective social elevator. In spite of all these enormous advantages of transnational programs, some recruiting problems still exist. It remains to better communicate and advertise these benefits in order to attract a bigger number of European computer science students.

7. References

[1] O. BRACHT, C. ENGEL, K. JANSON, A. OVER, H. SCHOMBURG AND U. TEICHLER, *The professional value of ERASMUS Mobility, Final Report, Presented to the European Comission*, 2006. http://ec.europa.eu/education/erasmus/doc/publ/evalcareersum_en.pdf
[2] Deutsch-Französische Hochschule - Université franco-allemande
[3] M. HARFI, C. MATHIEU, *Mobilité internationale et attractivité des étudiants et des chercheurs*, Horizons stratégiques, 2006.

http://www.strategie.gouv.fr/revue/article.php3?id_article=37

[4] ISFATES-DFHI Institut Supérieur Franco Allemand des Techniques, d'Economie et des Sciences - Deutsch-Französisches Hochschulinstitut http://www.dfh-ufa.org/

[5] K. JANSON, H. SCHOMBURG AND U. TEICHLER, *The professional value of ERASMUS Mobility – The impact of International Experience on Former Students' and on Teachers' Careers*. Lemmens, 2009 (ACA Papers on International Cooperation in Education).

[6] G. MICHEL, *Why mobility is important for European students in computer science: review of 18 years of a Franco-German university training with a dual degree*. Conference Informatics Education Europe III (EEIII 2008) Venice, Italy, December 4th-5th, (2008), 5-16.

[7] Statistiques Letudiant, 2010. http://www.letudiant.fr/jobsstages/les-secteurs-qui-recrutent.html

[1] Statistiques Observatoire Université de Bourgogne, 2008. http://www2.u-bourgogne.fr/ODE/publi.php?n1=1&n2=34&n3=180

[8] E. TERRIER, R. SECHET, *Les étudiants étrangers : entre difficultés de la mesure et mesures discriminantes. Une application à la Bretagne*, Norois, 203, (2007) 67-85. http://halshs.archives-ouvertes.fr/halshs-00177666/fr/